

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)**SciVerse ScienceDirect**

Procedia - Social and Behavioral Sciences 28 (2011) 877 – 881

---

**Procedia**  
Social and Behavioral Sciences

---

WCETR 2011

## The role of instrument technology in teaching architecture

Masoud Azizinezhad <sup>a\*</sup>, Akbar Amini <sup>b</sup><sup>a</sup>MA in Translation Studie Department of English, Toyserkan Branch , Islamic Azad University, Toyserkan, 6581685184, Iran<sup>b</sup>MA in Architecture, Department of English, Toyserkan Branch , Islamic Azad University, Toyserkan, 6581685184, Iran

---

### Abstract

Improving students' creativity is one of the obsessions of architecture teachers, dealing with which puts forward complicated pedagogical issues. Having in mind the great influence creativity exerts on the students while they deal with environment designing as well as educational strategies of the teacher and the relationship between the two, one can see that this is one of the most fundamental principles in architecture education. The three-dimension theory of behavior, creativity and tools is a proof to the mentioned importance where behavior refers to personal issues and a congruent interaction between the teacher and student which is the link between the other two fuzzy principles (Rogers, 1989). However, what is discussed among educational behaviorists when it comes to tools is the tools technology which has an important and overwhelming effect on all aspects of education. So, the role of technology in educational tools needs suitable understanding and an all-embracing analysis for making the use of the tools in education of architecture valuable. In this article attempts has been made to offer a critical discussion of the quantitative as well as qualitative role of technological tools in architecture education in the related colleges and at the end, show the relationship between different affecting factors.

*Keywords: Instrument, Technology, Teaching, Architecture*

---

### 1. Introduction

Discussion of factors affecting students' mentality while learning architecture is quite a broad arena. However, the pillars of the relationship between teaching architecture and technology are, to a lot of extent, determinant of a suitable route for providing students with a creative mind and above that, a decision-making mind. No need to say, the process of teaching is vitally depended on the teacher's educational management abilities yet. Recently, different dimensions of technology in architect education have found grounds from two perspectives: Method and Tools.

### Methods

If we define method as a system of personal or group decisions with a centralize look to the final outcome then the basic change of this system in the period when education is offered to the students becomes a matter of importance for the students (Langton, 1989). Exploration of principles that can improve this system through time is a sign of the relation between educational developments dependent on elapse of time which has always allocated a great part of the quality of education of architecture to itself. Of course specialized teaching of architecture in which the visual aspects are more prominent than the theoretical ones is, to a great deal dependent on the method and quality of introduction of the materials by the teacher. So, one can see that lesson plan and management of the materials to be

---

\* "Masoud Azizinezhad". Tel.: +989183514101

E-mail address: [mazizinezhad@gmail.com](mailto:mazizinezhad@gmail.com)

presented is the first affecting factor on education of architects (Adcock, 1981). The strategies a teacher can adapt include:

- a. Choice of the congruent course by the teacher
- b. Optimizing the course system aimed at a better processing of the education.
- c. The capability of the materials to establish a relationship with the students.
- d. Taking into account updated and active educational feedback in relation to students' mental environment

In order to improve students' creativity the teacher should make use of techniques i.e. methods that create a suitable behavioral relationship between the teacher and students for taking advantage from the educational content of the program (Vallée, 1981). This is especially important in architecture design studio which consist more than 70% of the architecture classes.

In order to be successful in implementing the methods there need to be some tools which are discussed in the following session.

## **2. Tools**

In the previous section it was pointed out that planning theories is based upon modern technologies that are mostly of the design studio type. What is vitally important in this process is the kind of instrument that the instructor uses to realize three parts of technological theory of education that is: basic components, organization and product.

During the 90s when computer found grounds in education, the level of mental creativity in students increased by a lot and the boundaries of mental creativity and conceptualization broadened. Educational concepts during the decades before the 90s were based on analysis, conceptualization and manual tools while in the modern era tools were not only considered as a means to facilitate to present architectural ideas but as a very useful system for a creative mind.

The basis of architectural education using computer can be put in three categories:

- a. Conceptualization
- b. Editing the concept and plan
- c. Selection of the final plan and simulation

Providing the students with congruent technological tools is a major task of the teacher especially in the design studio. The misuse of the tools in relation to the three stages stated above not only results in bad habits with regards to the relationship between the students and the teacher but also the misunderstanding and wrong concepts on the part of the student. This leads students to a mental dead-end of the decision-making process and incapability in differentiating between abstract and concrete entities in the creative mind (Adrian, 1979).

In the early stages of their engagement of computer technology, architects approached the technology as an assistive technology that would enhance the practice of architecture. The scope of the engagement was captured in the phrase 'computer-aided architectural design.' In the four decades since, the role of computer technology in architecture has gained a marked significance. The scope has now been extended for architects to contemplate 'totally computer-mediated architectural design.'

The key in the development of digital tools to enhance the practice of architecture has been the facility with which the various tasks involved in the practice of architecture have been represented, enabled or enhanced using computer technology (Feigenbaum, 1983). The digital representation of architectural entities and the digital manipulation of those entities have provided alternate means to produce architecture. Drawing, modeling, performance simulation, design collaboration, construction management and building fabrication are now routinely performed using computer-based technology. This success has revealed the untapped potential of the computational representation of architecture.

#### 4. Digital Production/Fabrication

The digital age has radically reconfigured the relationship between conception and production, creating a direct digital link between what can be conceived and what can be built through “file-to-factory” processes of computer numerically controlled (CNC) fabrication.

It was the complexity of “blobby” forms that drew architects, out of sheer necessity, back into being closely involved with the production of buildings (Edwards1996). In the process, they discovered they have the digital information that could be used in fabrication and construction to directly drive the computer-controlled machinery, making the time-consuming production of drawings unnecessary. The introduction of digital fabrication also enabled architects to produce scale models of their designs using processes and techniques identical to those used in the industry. Thus, a valuable feedback mechanism between conception and production was established.

This newfound ability to generate construction information directly from design information is what defines the most profound aspect of contemporary architecture. The close relationship that once existed between architecture and construction (what was once the very nature of architectural practice) could potentially reemerge as an unintended but fortunate outcome of the new digital processes of production. The digital generation of information to manufacture and construct buildings can render the present inefficient hierarchies of intermediation unnecessary. As constructability becomes a direct function of computability, the question is what new instruments of practice are needed to take advantage of the opportunities opened up by the digital modes of production.

#### 5. Digital Visualization

Digital Visualization addresses representational challenges from within and without Architecture.

‘Disciplinary’ Digital Visualization is used to explore, understand and communicate architectural information associated with the production of buildings. 3D modeling, rendering, animation and VR as well as the power of digital media to permit the seamless integration of various data types are unleashing completely new ways to display architecture. As digital power continues to increase and get cheaper, portability and wi-fi networks take root, and visualization work becomes even more main stream, we can expect growing changes in the way the design process is conducted, buildings are presented and documented, and the public and 3rd party’s demands from professional services. This demands a more conscious research/pedagogies aimed at developing new representation conventions.

‘Interdisciplinary’ Digital Visualization is a rapidly expanding area of expertise with competency ranging from artificial environments (e.g., video game worlds, cinematographic stage sets, web and other cyber environments) to abstract data representation constructs (i.e., information architecture). This type of work has already generated quite a number of new jobs, educational programs and research projects in many industries, schools and universities. Whether or not this type of knowledge implies a different type of architect (e.g., information architect) is subject to debate. What is beyond argument is the fact that the need for this kind of expertise will only grow in the coming years. Therefore, it is imperative that architecture programs pay serious teaching and research attention to the areas of digital visualization.

#### 6. Digital Projects: Defining Digital Architecture

Architecture is presently engaged in an impatient search for solutions to critical questions about the nature and the identity of the discipline, and digital technology is a key agent for prevailing innovations in architecture. Although, this is really nothing new, as new technology has always been a catalyst for new ideas in architecture. A positive digital future in architecture requires a clearer definition of principles and skills necessary to maintain a rigor in emerging digital projects.

What is digital architecture? Architectural ideas have found new forms of digital representations, as information reconfigures into digital visualizations, and projects evolve further as digital fabrications. However, using digital technology doesn't necessarily constitute creating digital architecture. Ideas are still scrutinized by the author(s). Thus, a responsibility for a critical dimension still falls upon the author(s). Any new categorizations of architecture must connect equally with the critical as well as the technological skill base of the authors. Just as there is a difference between building and architecture, there is also a distinct difference between digitally generated projects and digital architecture.

digital skills: Digital architecture requires proficiency with a specific foundation set of digital skills such as: 2D composition, vector graphics, image manipulation, 3D modeling: surface modeling, solid modeling, video editing, motion graphics, rendering, animation, parametrics, drafting, communications, layout, printing, presentation, database operations, web interface, CAM-based fabrication, performance analysis: lighting, structures, systems, etc. However, innovative digital projects will not sacrifice the development of this skill set at the expense of a critical problem-solving dimension. Thus, we must carefully consider the guidelines for what truly constitutes a digital "architecture" project.

## 7. Digital Thinking

The computer has gone from being an isolated box to become part of a gigantic digital network of networks, which shapes our collective future. The way and pace at which we connect, communicate, memorize, imagine and control the flows of valuable information have changed forever. There are at least six digital phenomena that directly affect the architectural world: miniaturization (of all that can be shrunk), ubiquity (being everywhere, global), realtime (communing globally in realtime, which is 1/10th of a second), noospherization (networking every-thing), virtuality (all that is solid melts into knowledge), and anamnesia (inability to forget). Temporal contiguity and temporal connectivity have taken precedence over spatial and geographical contiguity. The strands that animate our life today emanate from spatially distant but temporally contiguous/connected places. These phenomena have squeezed, stretched, restructured, reconfigured, and redistributed most major human institutions. Consequently, the built world's role, importance and nature have changed. Architecture as traditionally understood has become more marginalized than before. Many practices, however, have been repositioning themselves to take advantage of the new opportunities beyond the bounds of traditional architectural practice. Design, practice, fabrication and construction are increasingly becoming networked affairs. The new measures of architecture are connectivity and speed. The architecture of a new world needs to recognize these transformations and think differently.

## 8. Conclusion

As methods of representation change, Architecture's definitive boundaries transform. Relationships between disciplines may join more readily, forging collaborative partnerships. Students now enter architectural education and the profession from a technologized generation more facile and familiar with digital tools and environments, and they begin to effect representational changes in both education and the profession from the bottom up.

We may in the future see a proliferation of cybrid settings that support collaborative, digital design. The technologies for this already exist in collaborative tools, networked computing, scanning and immersive media. However, it will take a creative vision to see how these disparate tools and devices can integrate within the ideal design setting.

## References

- Adcock, Craig. 1981. *Marcel Duchamp's Notes from the Large Glass: An N-Dimensional Analysis*. Ann Arbor: UMI Research Press.
- Adrian, Robert. 1979. "Decentralisation: Communications as Content." In *Zur Definition eines neuen Kunstbegriffes*, ed. Ursula Krinziger. Innsbruck: Forum für Aktuelle Kunst.
- Bureau, Annick, ed. 1992. *Digital Photography*. Exhibition catalogue. Paris: Centre national de la photographie.

- Edwards, Paul N. 1996. *The Closed World: Computers and the Politics of Discourse in Cold War America*. Cambridge, Mass.: MIT Press.
- Feenberg, Andrew. 1995. *Alternative Modernity: The Technical Turn in Philosophy and Social Theory*. Berkeley and Los Angeles: University of California Press.
- Feigenbaum, E. A., and Pamela McCorduck. 1983. *The Fifth Generation: Artificial Intelligence and Japan's Computer Challenge to the World*. Reading, Mass.: Addison- Wesley.
- Langton, Christopher G., ed. 1989. *Artificial Life: The Proceedings of an Interdisciplinary Workshop on the Synthesis and Simulation of Living Systems, Held September 1987 in Los Alamos, New Mexico*. Santa Fe Institute Studies in the Sciences of Complexity, 6. Redwood City, Calif.: Addison-Wesley, Advanced Book Program.
- Rogers, Everett M., and D. Lawrence Kincaid. 1989. *Communication Networks: Toward a New Paradigm for Research*. New York: Free Press.
- Vallée, Jacques, ed. 1981. *Saturn Encounter: Transcript of an International Computer Conference on Future Technology*. San Bruno, Calif.: Infomedia Corporation.